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FOCUSED REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION (ECC)

18.5L30.0

APRIL 21, 1983

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I. EXECUTIVE SUMMARY

This draft report summarizes the results of the focused remedial investigation/feasibility study (RI/FS) for initial remedial measures (IRM's) at the Environmental Chemical and Conservation Corp. (ECC) site. The focused RI/FS is required to evaluate alternative initial remedial measures for a site, determining their cost-effectiveness and appropriateness for implementation.

Following is a summary of the major conclusions developed in this report:

1. The no action alternative is unacceptable due to its failure to reduce or eliminate the significant health and safety hazards presented by the hazardous wastes contained onsite.

2. Very little space is available onsite for implementation of alternatives. Utilization of offsite areas would likely spread contamination to these uncontaminated areas. As a result, any viable alternative must have minimal space requirements.

3. Onsite containment of the hazardous wastes is a technically viable alternative. However, this alternative only serves to delay the eventual requirement for remedial action. Any delay in removal of the drums and bulk tanks permits further deterioration to occur. In addition, the costs incurred by implementation of this alternative only serve to increase the total site remedial costs to an unacceptably high level.

4. A review of state-of-art incineration practices and services has failed to uncover a commercially available, transportable incineration system that could be set up onsite. The EPA incineration facility in New Jersey is reportedly incapable of transport to a site without incurring significant damage.

5. Although onsite stabilization techniques have been applied successfully in some cases on specific, discrete wastes, it does not appear feasible at ECC. The large volume of wastes, the myriad of difficult wastes and the limited available space precludes any one stabilization process from being effectively applied.

6. Of the various alternatives evaluated, offsite disposal of the various wastes appears to be the most feasible technically and economically.

7. Based upon the information developed during this focused RI/FS, the following offsite disposal alternatives are recommended for implementation as IRM's:

   o Remove all drum wastes and empty drums and dispose of them offsite.

   o Following drum removal, remove all bulk liquids and portable bulk tanks and dispose of them offsite.

   o Treat wastewater onsite and transport it to the Belmont POTW collection system and treat a second time.

II. INTRODUCTION

A. PURPOSE

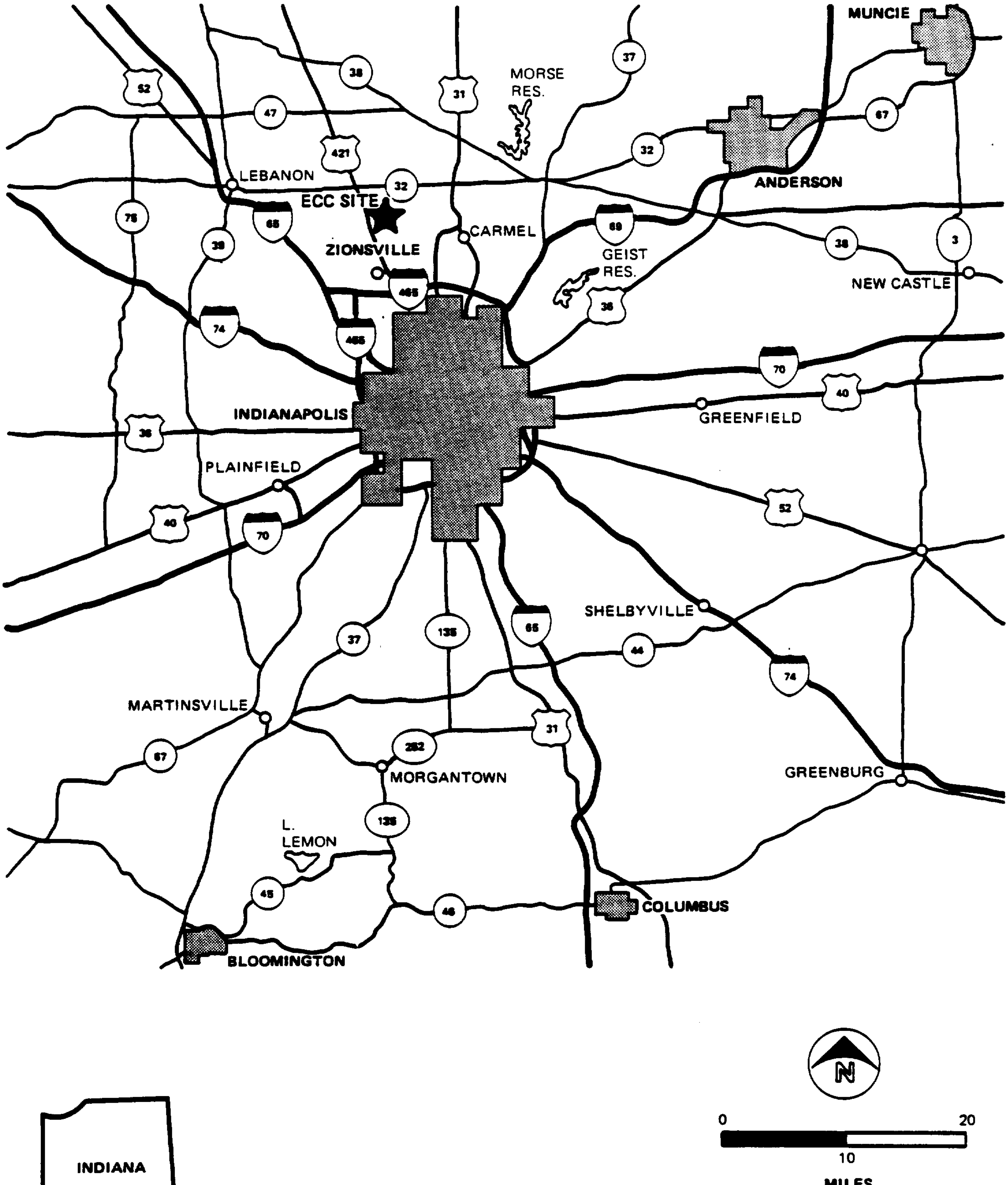
This report is a focused remedial investigation/feasibility study (RI/FS) for the Environmental Chemical and Conservation Corp. (ECC) site near Zionsville, Indiana. A focused RI/FS is a short-term study designed to evaluate initial remedial measure alternatives for the ECC site. Selected alternatives would be implemented as initial remedial measures (IRM's) to stabilize the site and to limit the exposure or threat of exposure to the significant health, safety and environmental hazards presented by the hazardous and contaminated materials onsite.

B. SITE DESCRIPTION

Environmental Conservation and Chemical Corporation is in Boone County, 865 south U.S. 421, Zionsville, Indiana, about 10 miles northwest of Indianapolis (Figure 1). The site occupies 6.5 acres within the 168 acre Northside Sanitary Landfill, an ongoing solid waste disposal facility permitted by the Indiana Stream Pollution Control Board (SPCB) (Figure 2).

The ECC facility is bounded on the south and east by the landfill. A site map is shown in Figure 3. An unnamed ditch separates the two facilities along the east boundary. The site is bounded on the north and west sides by several residential homes, located within one-half mile of the facility.

On the site are about 24,000 drums, 47 bulk storage tanks, a cooling water pond, process building and main office. Some of the drums are bulging, leaking, or otherwise damaged.



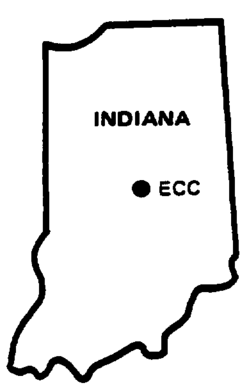


FIGURE 1
LOCATION MAP
ECC SITE

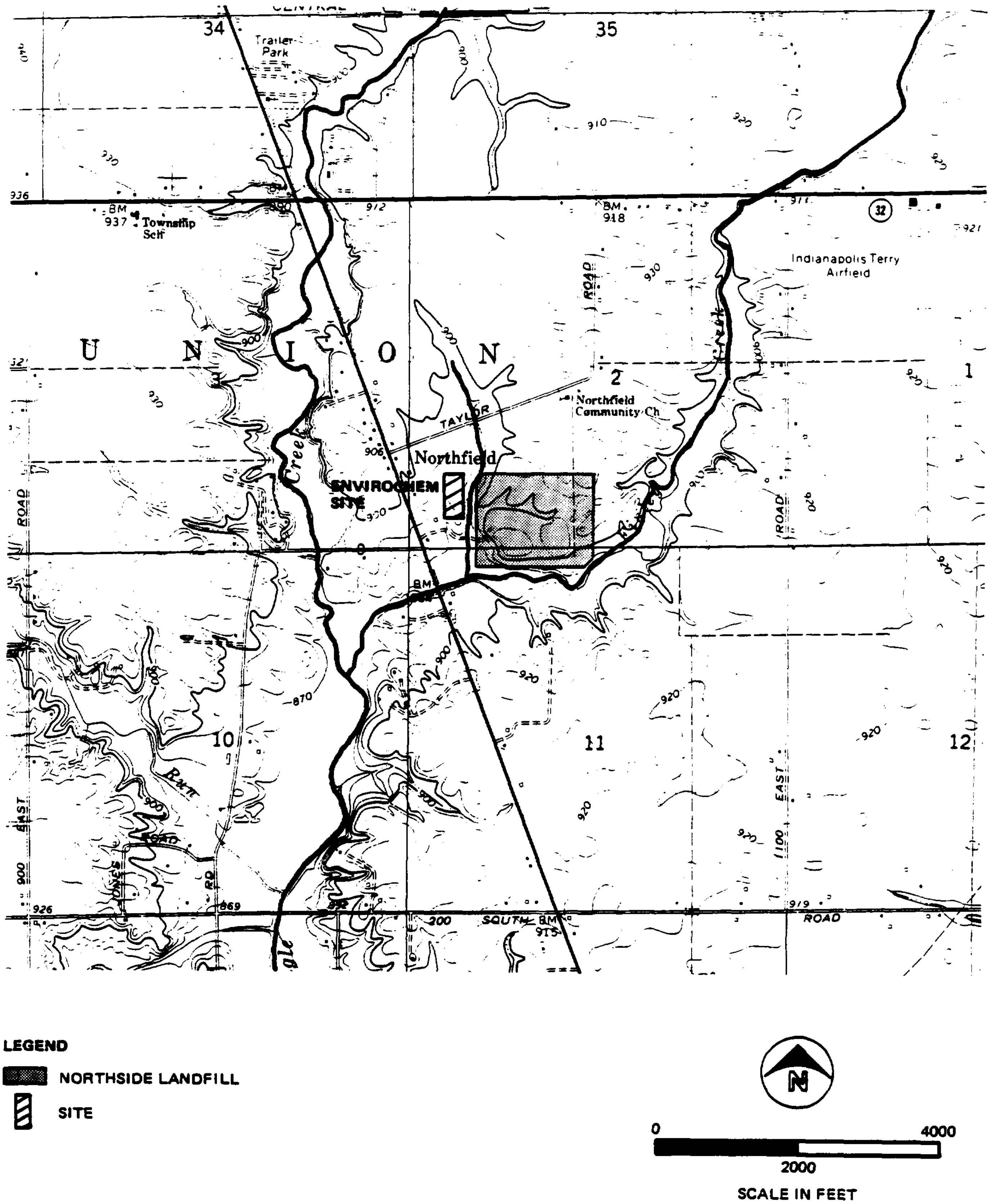


FIGURE 2
VICINITY MAP
ECC SITE

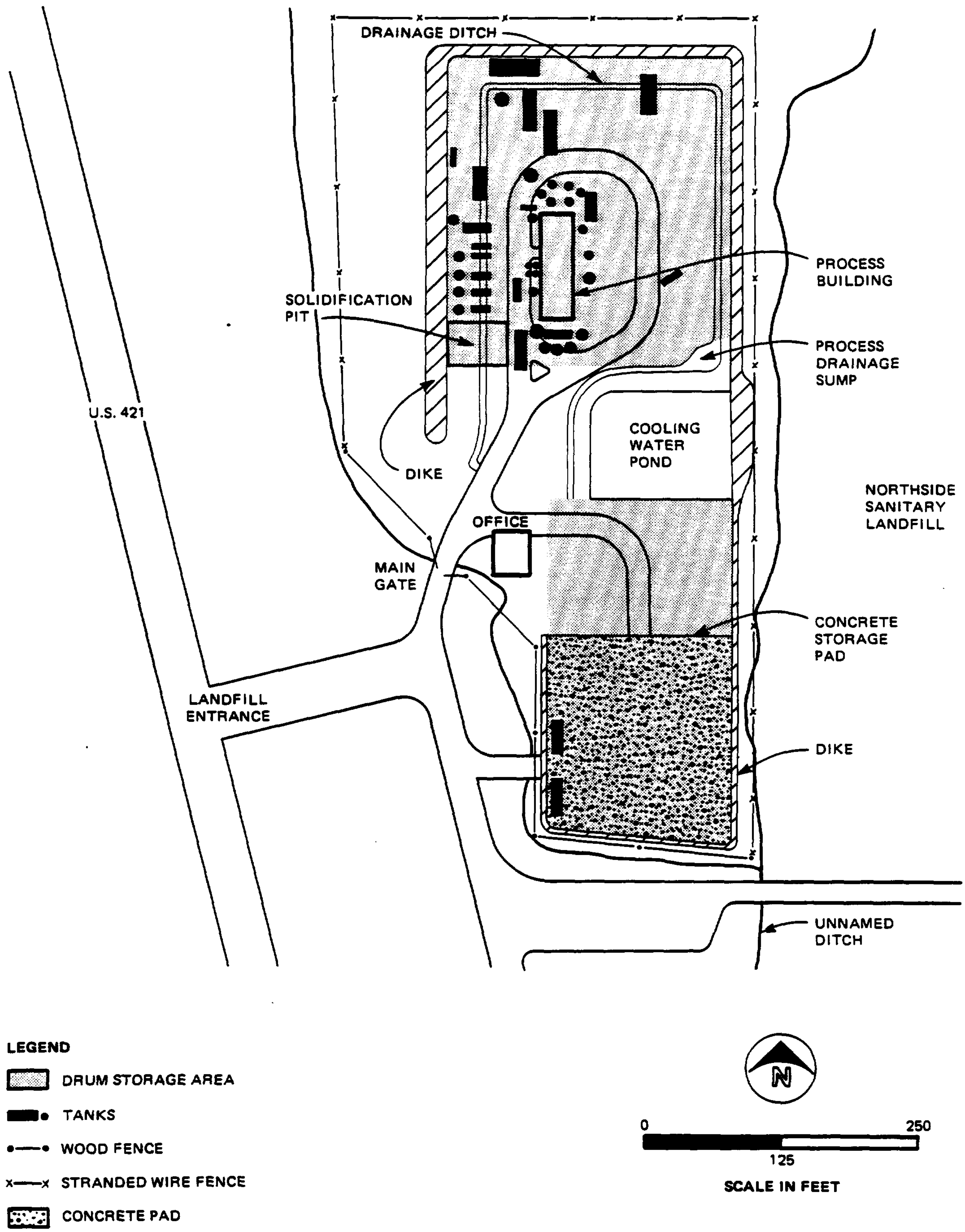


FIGURE 3
SITE MAP
ECC SITE

Most drums are stacked three and four high on a concrete pad (south storage area) and on the ground (north storage area). An earthen dike surrounds the immediate processing and storage area. A combination wood and stranded wire fence surrounds the entire site.

C. HAZARDOUS MATERIALS CHARACTERIZATION

Hazardous materials are found in the following containments onsite:

- Forty-seven bulk storage tanks containing about 300,000 gallons of hazardous waste.
- About 24,000, 55-gallon drums.
- An estimated 1,000,000 gallons of contaminated water in a cooling water pond.
- An estimated 500,000 gallons of contaminated water in ponds on the north and south drum storage areas.

These quantities represent estimates based on incomplete information.

Known materials processed at ECC during its recovery/reclamation/brokering operations are listed in Table 1. Descriptions of these materials are presented in Table 2.

Bulk Storage Tanks

The bulk storage tanks are located mainly in the northern portion of the site surrounding the process building. Known individual bulk tank storage volumes vary from 1,000 to 30,000 gallons. Table 3 is a partial bulk

Table 1
MATERIALS PROCESSED AT ECC

MATERIAL	PROCESS METHOD			ULTIMATE DISPOSAL		
	Distillation[a]	BTU Recovery	Fixation[b]	Distillates For Sale[c]	Incineration	Landfill
RECOVERABLE LIQUIDS						
Lacquer Thinner	X			X		
Paint Solvents	X			X		
Washup Thinner	X			X		
Chlorinated Solvents	X			X		
Ink Solvents	X			X		
Still Bottoms		X			X	
Scrap Paint		X			X	
Paint Resins and Pigments		X			X	
Scrap Glue		X			X	
Resin Additive		X			X	
Scrap Oil		X			X	
NONRECOVERABLE SOLIDS						
Paint Filters			X			X
Paint Solids			X			X
Vinyl Residues			X			X
Paint Booth Overspray Waste			X			X
Metal Hydroxide Sludges			X			X
Drum Bottoms			X			X
Settled Solids from Distillation			X			X

[a] Distillation on thin film unit.
[b] Fixation with sand, calcium, oxide, kitty liter or fly ash.
[c] Distillates sold, still botttoms disposed at secure landfill.

Source: ECC Records.

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Table 2 (page 1 of 2)

DESCRIPTIONS OF MATERIALS PROCESSED AT ECC

RECOVERABLE LIQUIDS

Lacquer thinner - A mixture of solvents composed of members of the ketone and acetate families used to dilute lacquers for coating surfaces.

Paint Solvent - Specific industrial solvents such as methyl ethyl ketone, toluene, xylene, etc., used in industries to thin paint, speed up or reduce drying time, etc.

Washup thinner - Mixtures of flammable solvents used to strip paint from spray guns, machine parts, etc.

Chlorinated solvents - Mixtures of nonflammable solvents such as tetrachloroethylene, methylene chloride, and trichloroethylene that are generally used for degreasing metals in industry.

Ink solvents - Mixtures of flammable solvents composed of members of the acetate and alcohol families used to remove dyes and inks in the printing industries.

Still bottoms - The remaining portion (sludge) of a material that has been processed on a distillation unit.

Scrap Paint - Outdated paint, paint that has been made incorrectly, or paint that will not meet a customer's needs.

Paint Resins & Pigments - Outdated resins and pigments used in the production of latex and enamel paints that will no longer meet quality standards.

Scrap Glue - Outdated glue, glue that has been made incorrectly or will not meet a customer's needs.

Resin additives - Plasticizers (nonvolatile compounds) and dispersion agents.

Scrap Oil - Used oils that have been contaminated with water, dirt, metal shavings, etc.

NONRECOVERABLE SOLIDS

Paint Fillers - Spent filters that have been contaminated beyond use.

Paint Solids - Solids that have settled out of old paint and will not disperse back into the paint solution.

Table 2 (page 2 of 2)

Vinyl residues - Old vinyl resins that have hardened due to evaporation of solvents from the original mixture.

Overspray paint booth waste - A solid waste that consists of reacted, film-forming paint that has been scraped from a paint spraying process.

Metal hydroxide sludges - Sludges from the plating industry that contain metals tied to hydroxide groups.

Source: ECC Records.

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Table 3

PARTIAL BULK STORAGE TANK INVENTORY

Tank ID	Contents	Capacity (gal)
A	Oil Processing	10,500
B	Solvent Still	10,500
C	Solvent Storage	10,500
D	Oil Storage	10,500
E	Solvent Coalescer	5,000
F	Fuel Oil Product Storage	30,000
G	Fuel Oil Product Storage	13,000
1	Waste Solvent & Oil Storage	10,500
2	Waste Solvent & Oil Storage	10,500
3	Waste Solvent & Oil Storage	5,000
4	Waste Solvent & Oil Storage	5,000
5	Boiler Fuel Oil	2,000
6	Clean Solvent Storage	1,500
7	Clean Solvent Storage	1,500
8	Clean Solvent Storage	20,000
9	Clean Solvent Storage	20,000
10	Still Bottom Storage	15,000
11	Waste Solvent Storage	10,500
12	Still Bottom Storage	1,500
13	Waste Solvent Storage	3,000
14	Waste Solvent Storage	4,500
15	Solvent Drying Process	1,000
16	Solvent Drying Process	1,000
17	Fuel Oil Storage	10,000
18	Fuel Oil Storage	10,000
19	Fuel Oil Storage	10,000
20	Fuel Oil Storage	7,500
	Total	166,500

Source: ECC Records.

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tank inventory. Bulk tank locations are identified in Figure 4. Of the remaining 20 tanks, at least 5 are tanker trucks that have been parked onsite. There are reportedly two buried tanks onsite, but this has not been verified.

Available test data indicate that sampling and analysis of the bulk storage tanks has been limited to one sample of a boiler fuel tank taken on May 6, 1980 by the ISBH. The fuel contained the following compounds:

Octane	6.2%
Acetone	13.3%
1,1,1-trichloroethane	1.6%
Methyl Ethyl Ketone	13.7%
Trichloroethylene	1.3%
Methyl Iso-butyl Ketone	3.0%
Toluene	18.4%
P-xylene	5.6%
M-xylene	20%
O-xylene	4.4%

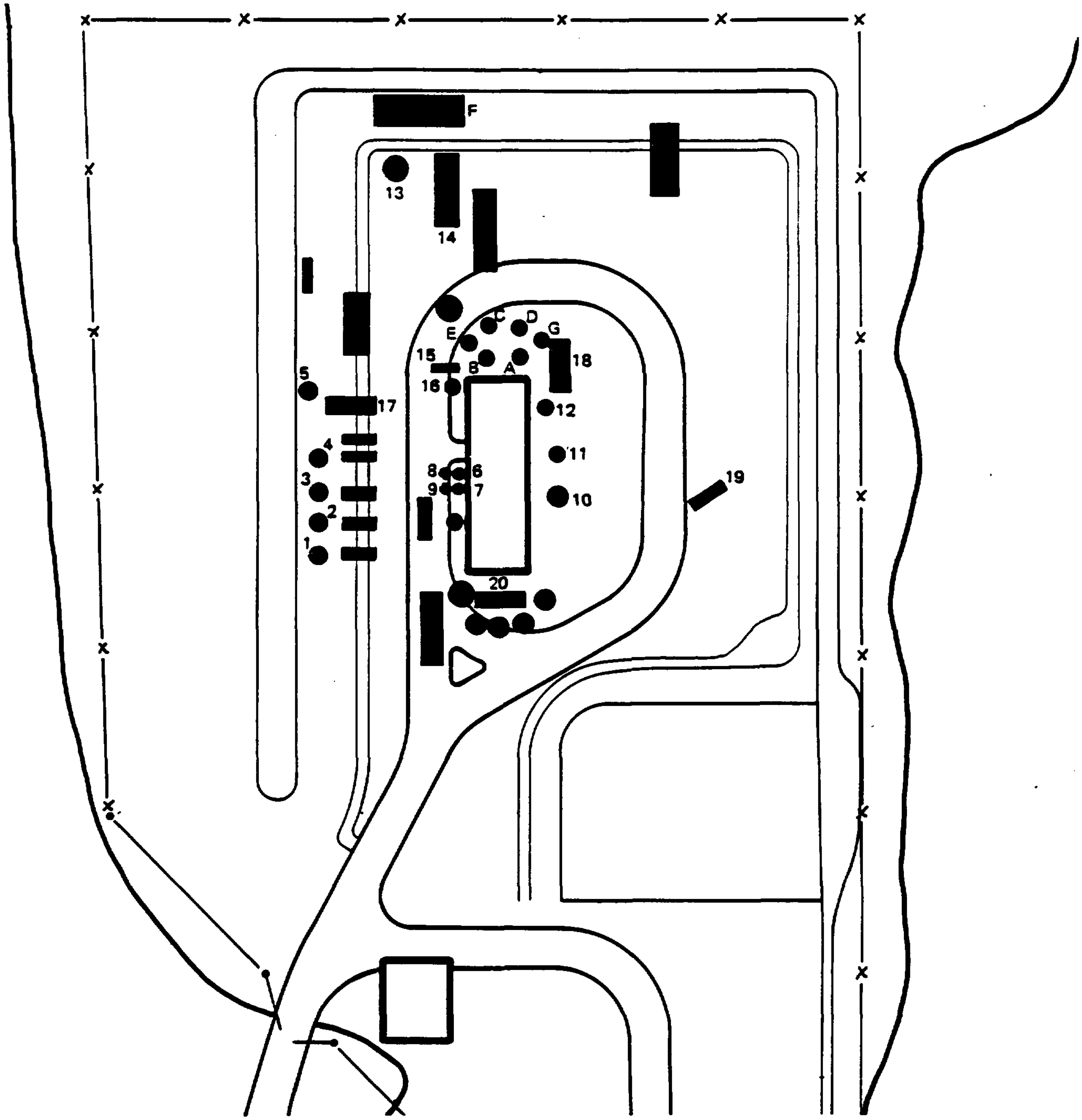
Analysis for heavy metals found the following:

Cadmium	less than 1 ug/l
Chromium	25 ug/l
Lead	74 ug/l
Nickel	4 ug/l
Zinc	179 ug/l

Fifty-five Gallon Drums

Fifty-five gallon drums are stored in the north and south drum storage areas, generally stacked three to four high (see Figure 3). An inventory of drums was conducted on November 25, 1981, 6 months before the site was closed. Results of the inventory are shown in Table 4.

Sampling and analysis of drums has not been undertaken. The majority of drums, however, are reportedly labeled and manifested according to RCRA regulations.



LEGEND

0 BULK STORAGE TANK NUMBER

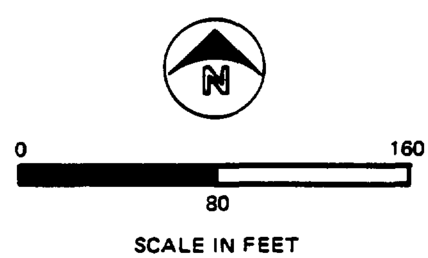


FIGURE 4
BULK STORAGE TANK LOCATION
ECC SITE

Table 4
GENERAL WASTE CATEGORIES FOR DRUMMED WASTES

	GENERAL WASTE CATEGORY DESCRIPTION	POTENTIAL DISPOSAL ACTIONS	ESTIMATED TOTAL NUMBER OF DRUMS
1.	Flammable Liquids (atomizable solvents)	Drum staging; compatibility testing; transport by P/V tankers; disposal by incineration	6,470
2.	Chlorinated Solvents (atomizable solvents)	Drum staging; compatibility testing; transport by P/V tankers; disposal by incineration	4,509
3.	Oils (atomizable liquids)	Drum staging; compatibility testing; transport by P/V tankers; disposal by incineration	699
4.	Flammable Solids (pumpable sludges)	Drum staging; compatibility testing; transport in repack fiberdrums or bulk tank trailer; disposal by incineration	3,595
5.	Solids (miscellaneous non-hazardous inert solids)	Drum staging; compatibility testing; transport in drums; disposal by landfilling	5,405
6.	Misc. Organic Liquids (nonflammable organic materials)	Drum staging; compatibility testing; transport in tank trailers; disposal by bulking & landfill	3,031
7.	Inorganic Solutions (misc. aqueous solutions)	Drum staging; compatibility testing; onsite treatment; transport in tank trucks; disposal by bulking & landfill	265
8.	Empty or Other	Crushing and disposal of drums in landfill	60
			24,034

(Source: Material Identification and Location, by Northrup, April 1982)

Cooling Water and Drum Storage Area Ponds

The cooling water pond is a rectangularly shaped basin in the central area of the ECC site (Figure 5). It receives surface runoff from the site and, as a result, has become contaminated. The pond has been sampled eight times from 1979 to 1982. Analytical results of several of these samples are shown in Table 5.

Contaminated water also exists in the north and south drum storage area. The approximate location of these ponded waters is shown in Figure 5. The ponds are about 2 feet deep at their deepest points. They have been sampled six times from 1979 to 1982. Table 5 presents analytical results for two of the six sampling dates.

Also shown in Table 5 are EPA ambient water quality criteria (WQC) for the substances found in the cooling pond or ponded waters.

D. POTENTIAL IMPACTS

Public Health and Safety

Public health and safety could be adversely affected due to any of the following conditions at the ECC site:

- Fire hazard
- Surface water contamination
- Groundwater contamination
- Air pollution

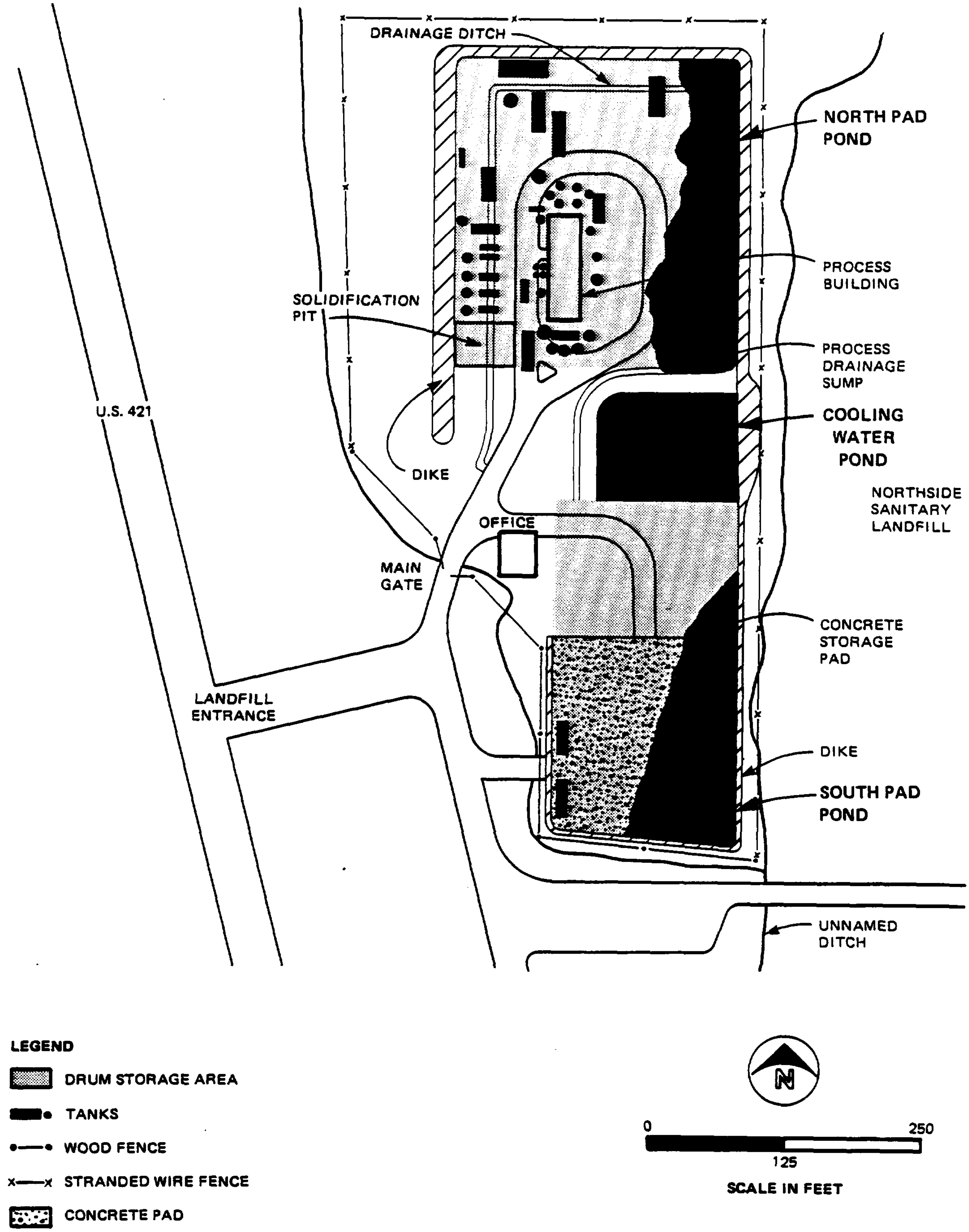


FIGURE 5
LOCATION OF COOLING WATER AND DRUM STORAGE AREA PONDS
ECC SITE

Table 5

CONTAMINANT CONCENTRATIONS AND WATER QUALITY CRITERIA FOR SUBSTANCES FOUND ONSITE (ug/l)

	PONDED WATER SAMPLES ANALYSIS RESULTS						EPA AMBIENT WATER QUALITY CRITERIA			
	Cooling Water Pond			Drum Storage Area Ponds			For Protection of Human Health[1]		For Protection of Aquatic Life[2]	
Substance	04/10/80	08/09/82	10/18/82	South 04/10/80	South 10/18/82	North 10/18/82	Toxicity	Carcinogenicity	Acute	Chronic
1,1,-Dichloroethane		17					NCA		NDA	NDA
1,1,1-Trichloroethane	6,821	831	1,322		621	1,266	18,400		52,800	NDA
1,1,2-Trichloroethane	16							6.0	36,000	9,400
1,1-Dichloroethylene	152	95	2,848					0.33	30,300	NDA
1,2-Dichloroethylene	259	2,022		48	1,541	2,766	NCA		135,000	NDA
Perchlorethylene	1,297	12	0.6		1,176	71		1.7	5,280	840
Trichloroethylene	3,873	191	673		1,176	1,398		6.0	45,000	NDA
Dichloromethane	5,470	1,329	3,908	485	3,873	5,548		1.9	193,000	NDA
Trichloromethane		21						1.9	28,900	1,240
Trichlorofluoromethane				14				1.9	NDA	NDA
Toluene	2,700			935			14,300		17,500	NDA
Nitrophenol	270						NCA		NDA	NDA
Pentchlorophenol	38			103	5		1,010		55	3.2
Phenol	1,930	15,000	396		460	325	3,500		10,200	2,560
2,4-Dimethylphenol		260	251	349	236	121	NCA		2,120	NDA
2,4,6-Trichlorophenol			5		4	3		12	720	720
Benzene						463		6.6	5,300	NDA
Methylbenzene		858	974		1,035	1,132				
Ethylbenzene		110		1,188			1,400		32,000	NDA
1,3-Dimethylbenzene		98								
1,2 & 1,4-Dimethylbenzene		79								
1,3-Dichlorobenzene			0.5		17	92	400		5,020	1,510
1,4-Dichlorobenzene			0.4		15	86	400		1,120	763
1,2-Dichlorobenzene			0.5	27	18	97	400		2,000	2,000
Diethylphthlate	27	86	47	433	32		350,000		52,100	NDA
Dimethylphthlate	311	240	175	513	169	164	313,000		33,000	NDA
Butylbenzylphthalate			1,122		3,277	2,457	NCA		3,300	220
Di-N-Butylphthalate		76	29		87	135	34,000		940	NDA
Napthalene			12		16	29	NCA		23,000	620
Isophorone		3,200					5,200		NDA	NDA
P-Chloro-M-Cresol				91		4	NCA		NDA	NDA

NCA = Insufficient data available upon which to derive a criterion.

NDA = No toxicity data available.

[1] 1980 EPA Ambient Water Quality Criteria for the protection of human health from the toxic properties of a pollutant ingested through water. Contaminated aquatic organisms assume a daily ingestion of 2 liters of water and 6.5 grams of potentially contaminated fish products.

[2] No criteria available. Values are lowest reported toxic concentrations in freshwater

The most significant immediate threat to public health and safety is the presence of large volumes of ignitable wastes onsite. Over 150,000 gallons of bulk storage liquid wastes and 500,000 gallons of drum wastes are classified as ignitable. A fire or explosion could occur onsite due to the toppling of drums containing flammable or reactive substances, the intermixing of incompatible substances leaking from corroded or otherwise damaged drums or tanks, leaking reactive materials from damaged drums or tanks, or possibly through arson. Any onsite fire could cause the generation of toxic fumes. Contaminants could be released into Finley Creek and ultimately the Eagle Creek Reservoir, a major source of drinking water for the city of Indianapolis. Fire fighting actions could lead to increased risks of offsite contamination through the discharge of large amounts of fire-fighting water.

Offsite surface water contamination has been documented by the ISBH. Continued overflow of the contaminated waters may lead to additional downstream contamination of Finley and Eagle Creeks. Bioaccumulation affects may also occur as a result of pollutants in surface waters and sediments.

The extent of groundwater contamination under the site is unclear due to the lack of data. There are numerous reports of shallow gravel and sand lenses beneath the site. The potential for groundwater contamination is also high due to the activities conducted onsite. Downgradient wells could be affected by a migrating contaminant plume.

Air emissions from the site may be a threat to public health, though data on specific contaminants is lacking. Vapors from the many volatile substances onsite or dusts blown up from contaminated soils could be transported offsite to nearby residences.

The poor condition of the fence surrounding the site allows access to the area by animals or people. It is possible that domestic dogs have been onsite and may be carrying contaminants into homes. Trespassers onsite would face hazards from poorly stacked barrels and the contaminated waters and soils. A danger exists that a fire would be started by someone unaware of the easily ignitable contents of many of the drums and tanks.

Environment

Overflows of the cooling water pond and the existence of an outfall pipe from the south barrel storage area have been documented. Continued overflows of the cooling water pond are likely during the spring and summer months. Gammon has speculated that contaminants from the ECC site may be contributing to the adverse effects on diversity and abundance of aquatic organisms found in Finley Creek. In addition to adverse effects on aquatic life, numerous trees surrounding the site have been damaged or killed. Effects on plant life are expected to be confined to the immediate vicinity of the site.

Terrestrial life may be adversely affected by contamination when drinking the water, feeding on vegetation or other animals, or by direct contact with soils.

Socioeconomics

The presence of a hazardous waste site in an agricultural and expanding residential area 10 miles from the City of Indianapolis could have significant adverse socioeconomic impacts. These impacts might include reduced property values and impairment of surrounding agricultural businesses. Contamination of the Eagle Creek Reservoir could greatly affect area socioeconomics either directly through the lowered availability of water for drinking and industrial use, or indirectly by relocation of city and suburban residents induced by fears and psychological stress because of potentially contaminated water.

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III. INITIAL REMEDIAL MEASURES

OBJECTIVE

The initial remedial measures (IRM's) discussed in this section are considered feasible and necessary to reduce imminent hazards to public health and the environment from the ECC site. They are consistent with the requirements of Section 300.65 of the National Oil and Hazardous Substances Contingency Plan (NCP). These hazards include the following:

- Potential contamination of local groundwater aquifers and drinking water supplies through the cooling water pond or site discharges to the groundwater.

- Potential contamination of downstream surface water resources and drinking water supplies through cooling water pond overflows or dike leaks to neighboring surface waters.

- Potential fire or explosion of ignitables, leading to a massive discharge of contaminants to the air and neighboring surface waters.

- Potential contact with acutely toxic substances by nearby residents, workers and animals through air or drinking water.

Based on observations from a visit to the ECC site on January 20, 1983, and the evaluation of available data during the RAMP preparation process, the following initial remedial measures were recommended:

1. Construct a 6-foot high steel fence around the site. This action is intended to prevent unauthorized direct contact with hazardous substances and contaminated materials onsite before and during the implementation of remedial measures.

2. Place warning signs around the perimeter of the site and on the fence to warn of the danger of unauthorized entry. This action is intended to prevent direct contact with any hazardous substances and contaminated materials onsite before and during the implementation of remedial measures.

3. Sample and analyze the contents of each bulk tank. Following the removal of all the drums, remove all materials from the bulk storage tanks as soon as possible and transport them to an approved disposal facility. This action is intended to reduce the imminent hazard of fire and explosion by expediting removal of the bulk tank contents.

4. Remove all drums as soon as possible. The intent of this action is to reduce the imminent hazard presented by the drums stored onsite. This action also reduces the potential for groundwater contamination from deteriorated drums.

5. Control site runoff and direct it to the cooling water pond for eventual treatment. This action is intended to use the existing cooling water pond as a collection sump for site runoff during initial remedial activities. Tank and drum washings, decontamination water and other miscellaneous drainages will also be directed to the cooling water pond.

6. Provide a trailer-mounted activated carbon wastewater treatment system to treat the slightly contaminated water from the cooling water pond and discharge the treated water to Finley Creek. The intent of this action is to treat cooling water pond contents with a temporary treatment system, discharging the clean treated water to the relatively uncontaminated Finley Creek. Timely acquisition and use of the treatment system will allow the pond level to be lowered before spring wet weather, providing needed surge capacity for the pond.

7. Relocate the existing office and process building power lines offsite. This IRM is intended to prevent a fire and/or explosion onsite due to accidental contact with the existing power line.

8. Prepare an onsite fire and explosion contingency plan. This action is intended to provide a contingency plan to respond to any fires or explosions that might occur on the site before the completion of initial remedial activities.

Of these recommended IRM's, only items 3, 4 and 6 were selected for evaluation in this focused RI/FS. These three IRM's were grouped into the classification of offsite disposal alternatives since they are intended to remove the hazardous wastes and contaminated water (wastewater) from the site and dispose of them offsite. The remaining recommended IRM's were judged either too insignificant in terms of cost or too straight-forward to warrant further study.

Three addition potential IRM's and the no action alternative were selected for evaluation in the focused RI/FS. Altogether, five alternatives were considered for the ECC wastes:

- No action
- Onsite containment
- Onsite incineration
- Onsite stabilization
- Offsite disposal

Each of these are discussed below.

A. NO ACTION

Under the no action alternative, all hazardous wastes in drums, bulk tanks and the ponds would remain onsite in their present arrangement until remedial actions (RA) are implemented at ECC. Remedial actions can be expected to be initiated onsite within one to two years.

A significant disadvantage to this alternative is the threat of corrosion and damage to the containers onsite. Approximately 220 of the 24,000 drums have already been identified as damaged or unsealed. This number is expected to increase under the no action alternative as drums deteriorate as a result of corrosion and temperature associated stresses. There exists the possibility that some of the stacked drums may be toppled during strong wind storms or perhaps by site intruders, sustaining damage and spilling their contents.

The 47 bulk tanks have not yet been inspected as to their structural integrity. As with the drums, corrosion of the bulk storage tanks can be expected to occur over time.

The contaminated ponded waters in the cooling pond and on the north and south drum storage ponds can be expected to overflow the dikes this spring in the absence of remedial measures. The existing freeboard on the cooling pond (approximately one foot), will allow the additional storage of approximately 100,000 gallons. This volume could easily be exceeded in one month with stormwater runoff. Rising water levels onsite would also cause a) increased drum corrosion and b) create additional difficulties with ultimate drum disposal operations.

Hazards associated with the continued storage of hazardous wastes and contaminated wastewater onsite in their present arrangement are:

- Potential fire or explosion of flammables, leading to an uncontrolled discharge of contaminants to the air and neighboring surface waters.

- Potential contamination of local groundwater aquifers and drinking water supplies through site discharges to the groundwater or surface water.

- Potential contact with acutely toxic substances by animals and nearby residents through the air or direct contact.

B. ONSITE CONTAINMENT

Onsite containment of hazardous wastes in the drums and bulk tanks and contaminated wastewater in the ponds could be accomplished to varying degrees of success by the following two methods:

- Construction of a dike around the perimeter of the site and construction of another dike around the cooling water pond.

- Staging of drums into compatible groupings in combination with grading and diking of new storage area and overpacking of damaged drums.

Dike Construction

The construction of a dike around the perimeter of the site would prevent offsite runoff from coming onsite and would contain onsite runoff from large storm events. In the case of a fire onsite, it would contain hazardous substances spilling from drums or tanks as well as the fire fighting waters. This method would only be a temporary measure until remedial actions at the site begin.

The dike would be approximately 3 feet in height, though this would vary depending on the ground elevation. The dike would tie into the existing dike that surrounds much of the northern half of the site and provide a complete earthen barrier around the site.

Containment of onsite runoff and contaminated pond water during the period preceding remedial action would require a dike to be constructed around the cooling pond to prevent flooding of the drum storage area. To allow storage of the projected 2.6 million gallons of annual runoff, this dike would need to be in excess of 20 feet high. To prevent the transport of contaminated water out of the pond due to the large hydraulic head created by such a system, additional protective measures would be required. These would be the placement of an impermeable membrane on the pond bottom and the construction of a slurry wall surrounding the pond. All these measures would be only temporary until remedial actions involving treatment/disposal of the contaminated waters could be undertaken.

Advantages and disadvantages of dike construction are listed in Table 6. This method is not considered to be a viable initial remedial measure because it does not reduce the air pollution or file hazards presented by the wastes. Containment of runoff and contaminated pond waters onsite is also not considered a viable alternative because of the high costs of constructing dikes, slurry walls and placement of an impermeable membrane, especially since this would be only a temporary measure until remedial actions of wastewater treatment and disposal could be undertaken.

Drum Staging

The main objective of drum staging as an IRM is to limit the potential for fire or explosion of flammables that might result from the intermixing of incompatible or reactive substances leaking from damaged drums or tanks. It would only be a temporary measure since all hazardous wastes would still eventually have to be disposed of during remedial activities.

This IRM would involve several steps:

- Grading and diking of a staging and storage area (approximately 15 additional acres) for runoff control and clay capping of the area

- Sampling and staging of drums with storage of compatible drums in rows 2 wide with no stacking

- Sampling, testing and staging of bulk liquids where necessary

Table 6 (Page 1 of 2)
EVALUATION OF ONSITE CONTAINMENT METHODS

Method	Drum Wastes	Bulk Tanks	Runoff and Contaminated Pond Water
Diking			
Advantages	o Eliminates run-on.	o Eliminates run-on.	o Eliminates run-on.
	o Temporarily eliminates offsite surface migration of wastes from damaged drums.	o Temporarily eliminates offsite surface migration of wastes from damaged bulk tanks.	o Temporarily eliminates offsite surface migration of wastes from individual storm events.
	o Eliminates uncontrolled discharge of wastes to surface waters from fire or explosion onsite.	o Eliminates uncontrolled discharge of wastes to surface waters from fire or explosion onsite.	o Eliminates uncontrolled discharge of wastes to surface waters from fire or explosion onsite.
Disadvantages	o Does not mitigate danger of hazardous air pollutants or physical damage to nearby residents as a result of fire or explosion onsite.	o Does not mitigate danger of hazardous air pollutants or physical damage to nearby residents as a result of fire. or explosion onsite	o Only temporary solution since runoff and contaminated pond water would still require treatment/disposal.
	o All drums would still require removal as a remedial action. Total costs would be greater than immediate drum removal costs.	o All tanks would still require removal as a remedial action. Total costs would be greater than immediate drum removal costs.	o High cost of constructing necessary slurry walls, dikes, and impermeable membranes for cooling pond.

Table 6 (Page 2 of 2)
EVALUATION OF ONSITE CONTAINMENT METHODS

Method	Drum Wastes	Bulk Tanks	Runoff and Contaminated Pond Water
Drum Staging			
Advantages	o Greatly reduces fire or explosion hazard.	o Fire and explosion hazard is reduced though large volumes of flammable wastes are still onsite.	N/A*
Disadvantages	o Increased area requirements for hazardous waste storage. o Costs of grading, diking and capping staging areas are costs not incurred for immediate drum removal. o Staging would add a cost of $20/drum in excess of costs for immediate drum removal. o Increased staging and storage area quadruples runoff to be treated.	o Costs for relocation of some bulk tanks are not incurred with immediate bulk tank content removal.	

*N/A; not applicable

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- o Overpack damaged or leaking drums as necessary

Advantages and disadvantages of drum staging are listed on Table 6. This method is not considered viable due to the increased costs incurred for this alternative relative to the immediate removal of drums and bulk tank contents. In addition, this alternative has a lower benefit than immediate removal since some hazard of fire and explosion onsite would continue to exist.

The implementation of either onsite containment method will require expenditures that are in addition to any subsequent expenditures required for waste removal during remedial activities. Thus, the net cost for site cleanup will be much higher than that incurred for site cleanup as an IRM. In addition, the continued onsite storage of the drums and bulk tanks will lead to their further degradation. The continued storage of contaminated wastewater may lead to substantial groundwater and/or surface water contamination. For these reasons, onsite containment is not considered a desirable alternative for the ECC site.

ONSITE INCINERATION

Onsite incineration of the hazardous and flammable wastes in drums and bulk tanks was not evaluated in detail for the ECC site due to the present lack of a commercially available portable incineration facility. The EPA does have a portable incinerator in New Jersey, however, it is still in a development stage and would be unavailable for IRM activities at ECC.

ONSITE STABILIZATION

Numerous processes are available for onsite stabilization of hazardous wastes. Processes that could be applicable to the ECC site fall within three categories:

- o Solidification
- o Encapsulation
- o In situ treatment

Solidification

Solidification of hazardous wastes at ECC would be limited to the contents of drums and bulk tanks. The processes involved are designed to seal the wastes in a hard, stable mass. The following processes could possibly have application to the various wastes onsite:

- o cement-based solidification
- o lime-based solidification
- o thermoplastic solidification
- o organic polymer solidification

Advantages and disadvantages of these processes are listed in Table 7. The major disadvantage of solidification is its limited applicability to the organic wastes which constitute the majority of hazardous wastes onsite. The thermoplastic process can be utilized for solid organic wastes but not liquid wastes. The organic polymer process is applicable to liquid organic wastes although its long-term effectiveness is questionable due to the biodegradablility of the polymers. Leaching of contaminants from the solidified mass is a problem for cement-based and lime-based solidification processes.

Costs for solidification vary from $2/drum for lime-based solidification to $150/drum for organic polymer solidification. In addition, all solidified wastes would still require

Table 7
EVALUATION OF ONSITE STABILIZATION METHODS

Method	Drum Wastes	Bulk Tanks	Runoff and Contaminated Pond Water
Solidification			
Advantages	o Eliminates fire or explosion hazard.	o Eliminates fire or explosion hazard.	N/A*
Disadvantages	o Limited applicability for liquid organic wastes.	o Limited applicability for liquid wastes.	
	o Leaching of contaminants from solidified mass is possible.	o Leaching of contaminants from solidified mass is possible.	
	o Costs of solidification are high and are in addition to remedial action costs incurred later for transport and disposal at licensed HW landfill.	o Costs of solidification are high and are in addition to remedial action costs incurred later for transport and disposal at licensed HW landfill.	
	o Remedial transport costs are increased due to increased weight and volumes of solidified wastes.	o Remedial transport costs are increased due to increased weight and volume of solidified wastes.	

*N/A; not applicable

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disposal at a licensed hazardous waste landfill as a remedial action. Due to solidification's limited applicability, lack of track-record and substantial costs, it is not considered a cost-effective alternative.

Encapsulation

Onsite stabilization of particularly toxic or corrosive wastes could be accomplished by encapsulating solidified hazardous wastes or damaged or corroded drums with a high density polyethylene. No large scale commercial encapsulation facilities, however, are presently available. Another encapsulation method would involve the construction of a clay-lined and capped storage area. However, the additional land requirements and capital costs render this method undesirable. For these reasons, encapsulation was not considered further.

In Situ Treatment

In situ treatment of contaminated runoff and ponded waters by microbial degradation is accomplished by seeding the contaminated water with specialized microorganisms. The cooling pond would essentially be converted to an aerated lagoon. This concept, however, is not feasible since the organic loading of the contaminated ponds and runoff is not sufficient to sustain the microorganisms. A great deal of operator attention will also be required for this alternative. Consequently, it is not considered a feasible alternative for the ECC site.

OFFSITE DISPOSAL

Offsite disposal alternative have been developed for each of the hazardous waste storage modes; drum wastes, bulk wastes and runoff and contaminated pond waters. Discussion of these alternatives follows in Section IV.

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IV. OFFSITE DISPOSAL ALTERNATIVES

A. DRUM WASTES

The ECC site has approximately 24,000, 55-gallon drums of waste placed in two general storage areas. Based on the waste material descriptions contained in a drum inventory entitled "Material Identification and Location" prepared by J. S. Northrup, ECC Corporation, April 9, 1982, the drums were subdivided into eight categories according to general physical and chemical properties. The waste drum categories are listed in Table 4.

A review of these groupings and their general characteristics and health and safety hazard potential led to the development of the following offsite disposal alternatives for drum waste removal:

- Removal of all drums containing flammable liquids and solids. Leave all other drums onsite for removal during remedial activities.

- Removal of all drums containing flammable liquids and solids, oils and chlorinated solvents. Leave all other drums onsite for removal during remedial activities.

- Removal of all drums containing flammable liquids and solids, oils and chlorinated solvents, and all other liquid wastes (i.e., all liquid wastes). Leave all other drums onsite for removal during remedial activities.

- Removal of all drummed wastes and drums.

Following is a discussion of each alternative.

Removal of All Drums Containing Flammable Liquids and Solids

The offsite disposal of only drummed flammable liquids and solids limits this alternative to a remedy of the imminent fire and explosion hazards at the site presented by the drummed wastes. Other toxic and/or combustible materials are not removed as a part of this alternative.

Materials removed in this alternative include all liquids described as "flammable" and specific liquids such as acetone. Materials described as "flammable solid(s)" were included within this alternative. The term "flammable" was the governing criterion for including waste in the flammable category. For example, materials described as "caustics and flammables" or "chlorinated and flammable liquids" were considered simply flammable liquids. Materials described as "chlorinated solvents" were not included in the flammables category and are not removed as part of this alternative.

Removal of All Drums Containing Flammable Liquids and Solids, Oils, and Chlorinated Solvents

This alternative removes, in addition to the drummed flammable wastes, all waste oils and chlorinated solvents. The chlorinated solvents category includes materials such as trichloroethylene, trichloroethane, methylene chloride, and "chlorinated liquids."

This alternative drum removal action removes all drummed materials that may burn, eliminating the fire and explosion hazard by drummed wastes. This alternative also eliminates the potential for groundwater and surface water contamination by drummed chlorinated organics.

Removal of All Drummed Liquid Wastes

The offsite disposal of all drummed flammables and liquid wastes includes, in addition to the previous alternative, all miscellaneous organic and inorganic liquids such as non-flammable or unreactive sludges and aqueous inorganic solutions.

Removal of All Waste Drums

The offsite disposal of all waste drums requires removal of approximately 24,000, 55-gallon drums. This scope of action eliminates all potential fire, explosion, toxic exposure, groundwater and surface water contamination hazards presented by the drummed wastes. Complete drum removal also permits grading of the drum storage areas for runoff control immediately following drum removal. Complete drum removal also eliminates a potential source of delay for RA activities that could result if drums remained onsite after IRM activities.

B. BULK WASTES

The ECC site reportedly contains 47 bulk storage tanks. The bulk storage tanks are located mainly in the northern portion of the site surrounding the process building. Known individual bulk tank storage volumes vary from 1,000 to 30,000 gallons. At least 5 bulk storage tanks are tanker trucks that have been parked onsite. There are reportedly two buried tanks onsite, however, this has not been verified.

A review of the available data on the volume and type of bulk storage wastes led to the development of the following offsite disposal alternatives for the ECC bulk wastes:

- Remove all bulk liquids as hazardous wastes with no combustion value. Bulk tank bottoms and sludges will be placed in drums and removed during drum removal activities.

- Remove most bulk liquids as hazardous wastes with no combustible value and selected wastes as combustible material. Bulk tank bottoms and sludges will be placed in drums and removed during drum removal activities.

- Remove all bulk liquids as combustible material. Bulk tank bottoms and sludges will be placed in drums and removed during drum removal activities.

Because of the lack of bulk waste test data, each bulk storage tank must be sampled and analyzed prior to offsite disposal. The resultant test data will permit the differentiation of bulk wastes into the hazardous waste or combustible waste categories. The bulk wastes will then be removed upon completion of the drum removal program.

C. WASTEWATER MANAGEMENT

Water collects onsite in three areas: the north drum storage pond; the south drum storage pond; and the cooling water pond. Approximately 1,000,000 gallons of water are contained in the cooling water pond. Each of the storage pad ponded areas contains about 250,000 gallons of water. The total volume of annual runoff entering the pond, is estimated to be 2.61 million gallons and would be distributed over a typical year as indicated in Table 8.

The "mixture" or character of the organic wastewater contaminants consists of a variety of volatile, acid, and

Table 8
AVERAGE MONTHLY PRECIPITATION[a] AND RUNOFF ESTIMATE[b]

Month	Average Precipitation,[a] in/Month	Estimated Runoff,[b] Gallons
January	2.6	172,030
February	2.1	134,400
March	3.4	232,200
April	4.2	292,400
May	4.0	277,400
June	4.5	315,000
July	3.8	262,300
August	3.0	202,120
September	2.9	194,600
October	2.5	164,500
November	2.9	194,600
December	2.5	164,500
	TOTAL	2,606,050

NOTES:

[a] The Indiana Water Resource, Clark G. Douglas ed, Governer's Water Resource Study Commission, Muncie Station, P. 24.

[b] Runoff based on 3.6 Ac site area, 35 inch/year evaporation rate, 0.75 runoff coefficient.

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base/neutral organic compounds. The character and concentrations of organic compounds are similar in the cooling water pond and drum storage areas. A few specific compounds such as benzene and dichlorobenzenes were found in higher concentrations in the drum storage ponds, probably because of a local leak or spill. Other compounds, notably 1,1-dichloroethylene and isphorone, were found in higher concentrations in the cooling water pond, perhaps indicating a past spill that did not affect the locations where drum storage water was collected.

Data on inorganic constituents are not available. However, concentrations of inorganic constituents are expected to be generally low because the ECC site received mostly organic wastes for reprocessing and recovery. Inorganic wastes stored onsite include mostly spent acids or caustics mixed with solvents.

The organic analyses data in Table 5 was used as the basis for evaluating the wastewater treatment alternatives. These data are considered representative of the variety of organic contaminants and range of concentrations that may be expected in "typical" wastewater at the site. The treatment alternatives do not include special consideration of treatment for large spills or major accidents that may occur during waste removal operations. Such major contamination events are assumed to be contained and controlled by the waste removal contractor. If a portion of a major spill did make its way to the cooling water pond, some dampening of the spill's "spike effect" on the wastewater treatment system can be expected.

Viable wastewater management alternatives must handle both the existing accumulated water and any stormwater runoff that may occur during future IRM and RA activities. The following offsite disposal alternatives were developed for management of wastewater on the ECC site:

- o <u>Treatment at a local POTW</u>.
- o <u>Treatment at a contractor-owned treatment facility</u>.
- o <u>Treatment onsite and discharge to a nearby creek</u>
- o <u>Treatment onsite and discharge to a local POTW</u>

Following is a discussion of each alternative:

<u>Treatment at a Local POTW</u>

Under this wastewater management alternative, tanker trucks would remove wastewater from the cooling water pond (and drum storage areas as needed), haul the wastewater to a large POTW, and release the runoff at a predetermined controlled rate into the influent of the POTW. Onsite equipment requirements would be minimal, probably limited to a wooden and/or steel structure to secure loading piping in one or two locations and crushed gravel or paving to bear the truck loadings on the site.

The tank trucks assumed for this operation were 5,500-gallon pressure/vacuum types that can load at the site without auxiliary pumps. The POTW selected was the Belmont Plant in Indianapolis. The Belmont Plant was selected for two reasons: it is a large POTW with an average design flow of 125 mgd, providing a dilution factor of over 5,000; it has a large pilot plant that is normally run in parallel with the main plant and can be used to test the treatability of the wastewater.

Treatment at a Contractor-Owned Treatment Facility

This wastewater management alternative is similar to the previous alternative except the wastewater is trucked to a licensed contractor-owned treatment facility. The treatment facility selected for this alternative is equipped with pressure filtration and three-stage granular activated carbon treatment. This facility is located in Cincinnati, Ohio, approximately 150 miles one-way travel distance from the ECC site. Wastewater would be transported to the facility, treated and disposed of by the facility.

Treatment Onsite and Discharge to a Nearby Creek

Under this wastewater management alternative, a treatment facility would be set up onsite to treat and discharge accumulated wastewater as needed to prevent uncontrolled overflow from the cooling water pond. The treatment system is assumed to include clarification, air stripping, mixed media filtration, and granular activated carbon adsorption. The treatment system contractor's responsibilities would include treatment system setup, operation, maintenance, and proper performance. Effluent quality control by chemical analysis and bioassays would also be performed by the contractor.

The tentative effluent criteria for offsite disposal of treated wastewater were described in a memorandum from Mr. Earl A. Bohner, Director of the Indiana State Board (ISBH) of Health to Mr. Phillip Rarick, Deputy Attorney General, dated December 22, 1982. The effluent limitations would be imposed through an NPDES permit for the discharge. Tentative effluent limitations are summarized in Table 9 with selected cooling water and drum storage pond data. From the table, air stripping and GAC appears to be required to meet

Table 9
TENTATIVE NPDES PERMIT EFFLUENT LIMITATIONS

Parameter	Tentative Limits Daily Maximum	COOLING WATER POND 04/10/80	COOLING WATER POND 08/09/82	COOLING WATER POND 10/18/82	DRUM STORAGE POND AREAS South 04/10/80	DRUM STORAGE POND AREAS South 10/18/82	DRUM STORAGE POND AREAS North 10/18/82	Basis for Discharge Limit Criteria
Flow	--	--	--	--	--	--	--	--
pH	9	--	--	--	--	--	--	--
TSS	15 mg/l	--	--	--	--	--	--	--
Cyanide, total	25 ug/l	--	--	--	--	--	--	Protection of Aquatic Life
Aluminum, total	0.5 mg/l	--	--	--	--	--	--	--
Chromium, total	0.1 mg/l	--	--	--	--	--	--	Protection of Aquatic Life
Iron, total	1.0 mg/l	--	--	--	--	--	--	--
Lead, total	0.3 mg/l	--	--	--	--	--	--	--
Arsenic, total	1.0 ug/l	--	--	--	--	--	--	Protection of Aquatic Life
Butylbenzylphthalate	50 ug/l	ND	ND	1,122	ND	3,277	2,457	Protection of Aquatic Life
Methylethylketone	5.0 mg/l	--	--	--	--	--	--	--
Dichloromethane	5.0 mg/l	5.47	1.33	3.91	0.485	3.87	5.55	--
2,4,6-Trichlorophenol	1.0 ug/l	ND	ND	5	ND	4	3	Protection of Human Health
1,1,1-Trichloroethane	25 ug/l	6,821	831	1,322	ND	621	1,266	BATEA (GAC)
Trichloroethylene	10 ug/l	3,873	191	673	ND	1,176	1,398	Protection of Human Health
Tetrachloroethylene	1 ug/l	1,297	12	0.6	ND	1,176	71	--
1,2-Dichloroethylene	50 ug/l	259	2,022	ND	48	1,541	2,766	BATEA (GAC)

discharge limits for butylbenzylphthalate, 2,4,6-trichlorophenol, 1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene, 1,2-dichloroethylene, and dichloromethane.

The treatment system would be operated initially to treat and discharge the approximately 1.5 million gallons of existing wastewater. Due to high standby costs, the system would be returned to the owner. Runoff waters would again fill the pond in approximately 4 months. The treatment system would be setup onsite again and the wastewater treated. This process would be repeated one more time in December. Treatment system operation and maintenance would be by contractor's personnel. Bioassay work would be performed as required by the contractor.

The requirements for bioassay work on the treated runoff discharge were described in the ISBH memorandum by Bohner. The bioassay work is to include 96-hour flow through tests with fathead minnows and parallel 48-hour flow through tests using Daphnia Magna. Survival of 95 percent of both test organisms at 100-percent effluent is required to permit discharge. Bioassays are required because of the presence of several toxic compounds for which synergistic and antagonistic effects are not known. Until the bioassay tests are completed, treated wastewater would be recycled to the cooling water pond. Upon successful completion of the required bioassays, the system effluent would be discharged to a neighboring creek.

Treatment Onsite and Discharge to a Local POTW

This alternative incorporates the onsite treatment facility described in the previous alternative. The treated wastewater, however, would be discharged to the collection system of the Belmont POTW. The nearest interceptor is located 10 miles from ECC. Effluent quality control for the onsite treatment facility would be maintained by chemical analysis. No NPDES permit would be necessary and hence bioassay work would not be required.

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V. OFFSITE DISPOSAL COSTS

Costs were estimated for the various offsite disposal alternatives discussed previously. Costs associated with the removal and disposal of drummed wastes and bulk wastes are based upon quotations received from contractors such as CECOS, SCA and Browning-Ferris. Costs for the treatment of wastewater at a local POTW were obtained from U.S. EPA personnel. Costs associated with drum handling, sampling and testing, transportation and other ancillary activities were developed from conversations with vendors, state and EPA personnel and Superfund project personnel. All costs must be considered order-of-magnitude because of the many variables involved and the many assumptions required at this stage of remedial investigation activities.

A. DRUM WASTE OFFSITE DISPOSAL COSTS

Table 10 lists the various estimated costs for the four drum waste offsite disposal alternatives. The various assumptions needed to prepare the data in the table are listed below the table.

The number of drums to be removed from and disposed of offsite ranges from 10,764 to all drums (24,034) for the total removal alternative. Costs for drum removal were estimated for two separate removal methods: 1) repacking drum wastes in fiber drums; 2) bulking drum wastes when possible. Costs for the latter method are listed within parentheses. Because the drums are stacked three and four high in an extremely small area, it was assumed that all the drums would have to be handled, regardless of the offsite disposal alternative selected. Handling, transportation, analysis and disposal costs for each alternative increase in direct

Table 10
ESTIMATED COSTS FOR DRUM REMOVAL ALTERNATIVES

Drum Removal Alternative	Estimated Number of Drums Removed in IRM[a]	Percent of Drums Removed in IRM	Estimated Number of Drums Handled in IRM[a]	IRM DRUM REMOVAL COST ESTIMATES[b] Handling[c]	Transportation[d]	Analysis[e]	Disposal[f]	Total	Estimated RA Drum Removal Cost Total[g]	Estimated Ultimate Drum Removal Total Cost	Percent of Lowest Ultimate Estimated Cost
1. Remove only flammable liquids and solids	10,764	44.8	24,034	978,000	119,400	132,700	467,200	1,697,300	1,151,500	2,848,800	115
	10,764	44.8	24,034	(843,200)	(106,400)	(99,800)	(330,200)	(1,379,600)	(1,151,500)	(2,531,100)	(118)
2. Remove all flammable liquids & solids, oils & chlorinated solvents	15,273	63.6	24,034	1,068,200	165,000	165,000	544,700	1,943,400	777,100	2,720,500	110
	15,273	63.6	24,034	(924,400)	(155,500)	(132,100)	(407,700)	(1,619,700)	(773,800)	(2,393,500)	(111)
3. Remove all flammable liquids & solids, oils & chlorinated solvents, and all other liquid wastes	18,569	77.26	24,034	1,150,600	159,200	213,800	621,100	2,144,700	498,100	2,642,800	107
	18,569	77.26	24,034	(1,006,800)	(146,200)	(180,900)	(484,100)	(1,818,000)	(498,100)	(2,316,100)	(108)
4. Remove all waste drums	24,034	100.0	24,034	1,258,100	218,900	322,000	682,200	2,481,200	0	2,481,200	100.0
	24,034	100.0	24,034	(1,114,300)	(205,900)	(289,100)	(545,200)	(2,154,500)	0	(2,154,500)	(100.0)

NOTES:

[a] Source of drum inventory and waste description data is "Material Identification and Location" by J.S. Northrup, ECC Corp., April 1981.

[b] Two sets of order-of-magnitude costs estimates were proposed for each alternative to account for two methods of handling flammable solids. The first estimate assumes flammable solids repacked into fiber drums for transport and incineration. The second estimate, in parentheses, assumes flammable solids are composited on site then hauled and incinerated in bulk.

[c] Order-of-magnitude handling costs include all onsite drum handling, loading, treatment, safety equipment, equipment rental, labor, and supervision by contractor.

[d] Transportation assumes 180-mile one-way haul distance to the incinerator and 100-mile one-way haul distance to an approved landfill for nonhazardous materials. Transportation includes cost of crushed empty drum handling.

[e] Analysis assumes simple compatibility tests on all drums and comprehensive organic and inorganic (if required) analysis on bulk tank truck loads.

[f] Disposal assumes incineration of all flammable liquids and solids in addition to waste oils and chlorinated solvents. Other inorganic and organic liquids and solids are assumed to be treatable and bulkable for disposal in an approved landfill. Disposal includes cost of crushed empty drum landfilling.

[g] RA work assumes a second drum removal effort for the drums remaining. RA work assumed within 2 years after IRM. Cost estimates include remobilization and additional drum handling costs.

proportion to the number of drums removed during IRM activities.

For those alternatives that remove only a portion of the drums during IRM activities, additional costs were estimated for subsequent remedial action drum removal work. These estimated costs were added to the IRM drum removal costs to obtain the estimated ultimate drum removal costs.

B. BULK WASTE OFFSITE DISPOSAL COSTS

Table 11 lists the various estimated costs for the three bulk waste removal alternatives and the no action alternative. The various assumptions needed to prepare the data in the table are listed below the table. The costs for the various alternatives decreases in inverse proportion to the combustion value attributed to the bulk liquid wastes. That is, if all bulk liquid wastes are treated as hazardous wastes with no combustion value, the total offsite disposal costs will be high. If the hazardous materials do have a combustion value and can be given to a removal contractor that will remove the wastes at no cost, then the total offsite disposal costs will be low.

C. WASTEWATER OFFSITE DISPOSAL COSTS

Table 12 lists the various estimated costs for four runoff management alternatives. Tables 13, 14, 15, and 16 detail the estimated costs for each of the runoff management alternatives and lists the assumptions needed to prepare the data included in the Table 12. The least expensive alternative is offsite disposal of wastewater at a local POTW. The most expensive alternative is offsite wastewater treatment (contractor) with offsite disposal. Alternatives 3 and 4

Table 11

ESTIMATED COSTS FOR BULK TANK LIQUID REMOVAL ALTERNATIVES

Bulk Tank Liquid Removal Alternative	Estimated Volume of Waste Liquid, Gallons	Estimated Volume of Combustible Liquid, Gallons	BULK TANK LIQUID REMOVAL COST ESTIMATES Handling	Transporation	Analysis	Disposal	Total
1. Remove all bulk liquids as hazardous waste	300,000[a]	0	4,700	31,400	37,600	174,000	247,700
2. Remove all bulk liquids, a portion as hazardous waste and the remainder as combustible material	153,500[b]	146,500	2,400	16,200	37,600	89,100	145,300
3. Give away all bulk liquids as combustible material	0	300,000	0	0	37,600	0	37,600

NOTES:

[a] Estimate of total volume based on the estimated total bulk tank capacity on the ECC site.

[b] Estimate based on assuming that selected volumes on the ECC tank inventory are contaminated waste and the "difference" between the estimated total bulk volume (300,000 gallons) and the inventoried volume (240,000 gallons) is contaminated waste.

[c] All cost estimates are order-of-magnitude.

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Table 12
ESTIMATED WASTEWATER MANAGEMENT COSTS

Alternative	Estimated Total Offsite Disposal Costs[a]
1. Treat Wastewater at Local POTW	$ 236,890
2. Treat Wastewater at Contractor Facility	$1,252,900
3. Treat Wastewater Onsite and Discharge to a Nearby Creek	$ 902,000
4. Treat Wastewater Onsite and Discharge to POTW	$ 971,600

[a]All costs are Order-of-Magnitude. Costs are for one year of wastewater treatment (per Table 8).

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Table 13
ESTIMATED COSTS FOR WASTEWATER MANAGEMENT
ALTERNATIVE 1

Month	Trucked Volume MG[a]	Estimated Number of Loads[b]	Estimated Total Travel Distance Miles[c]	Estimated Hauling Cost	Estimated POTW Treatment Cost[d]	Estimated Analytical Cost[e]	Estimated Total Cost[f]
April	1.646	314	23,864	$35,800	$29,630	$47,250	$112,680
May	0.277	53	4,010	6,010	4,990	8,250	19,250
June	0.315	60	4,560	6,840	5,670	9,000	21,510
July	0.262	50	3,800	5,700	4,720	7,500	17,920
August	0.202	39	2,964	4,450	3,640	6,000	14,090
September	0.195	38	2,890	4,340	3,510	6,000	13,850
October	0.165	32	2,432	3,650	2,970	5,250	11,870
November	0.195	38	2,890	4,340	3,510	6,000	13,850
December	0.165	32	2,430	3,650	2,970	5,250	11,870
	3.422					Total	$236,890

NOTES:

[a] See Table 8.
[b] Assuming 5,250 gallons per load using 5,500 gallon tankers.
[c] Assuming one-way haul distance of 38 miles.
[d] Assuming treatment cost at Belmont plant in Indianapolis of $18.00 per 1,000 gallons.
[e] Assuming organic scan with quantification of priority pollutant organics for one sample per 5 truckloads.
[f] The estimated total unit cost for runoff treatment over the 1983 period is $0.069 per gallon.

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Table 14
ESTIMATED COSTS FOR WASTEWATER MANAGEMENT
ALTERNATIVE 2

Month	Trucked Volume MG [a]	Estimated Number of Loads [b]	Estimated Total Travel Distance Miles [c]	Estimated Hauling Cost	Estimated Treatment Cost [d]	Estimated Analytical Cost [e]	Estimated Total Cost [f]
April	1.646	314	94,200	$141,300	$411,500	$47,250	$600,050
May	0.277	53	15,900	23,850	69,400	8,250	101,500
June	0.315	60	18,000	27,000	78,800	9,000	114,800
July	0.262	50	15,000	22,500	65,600	7,500	95,600
August	0.202	39	11,700	17,550	50,600	6,000	74,150
September	0.195	38	11,400	17,100	48,800	6,000	72,800
October	0.165	32	9,600	14,400	41,400	5,250	61,050
November	0.195	38	11,400	17,100	48,800	6,000	71,900
December	0.165	32	9,600	14,400	41,400	5,250	61,050
	3.422					Total	$1,252,900

NOTES:

[a] See Table 8.
[b] Assuming 5,250 gallons per load using 5,500-gallon tankers.
[c] Assuming one-way haul distance of 150 miles to Cincinnati, Ohio.
[d] Assuming contractor treatment cost of $0.250 per gallon. Actual treatment cost is a direct function of GAC usage.
[e] Assuming organic scan with quantification of priority pollutant organics for one sample per five truckloads.
[f] The estimated total unit cost for runoff treatment over the 1983 period is $0.24 per gallon.

Table 15
ESTIMATED COSTS FOR WASTEWATER MANAGEMENT
ALTERNATIVE 3

Month	Estimated Treated Volume,[a] MG	Setup and Take down Cost	Operating Cost[b]	Standby Cost[c]	Estimated Activated Carbon Cost[d]	Estimated Bioassay Cost[e]	Total[f]
April	1.646	$35,000	$42,000	$10,000	$274,000	$20,000	$381,000
May	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--
Aug.	1.06	35,000	30,000	10,000	190,000	20,000	285,000
Sept.	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--
Dec.	0.72	35,000	21,000	10,000	150,000	20,000	236,000
Total	3.422						$ 902,000

NOTES:

[a] See Table 8.
[b] Including equipment rental, maintenance, and operating labor. Daily estimated rate $5,250 with 150 gpm treatment flow rate.
[c] Standby cost includes equipment rental during nonoperating periods. Daily estimated rate $2,250 with 2 days of standby assumed for each operating period.
[d] Activated carbon consumption based on an average COD concentration of 6,000 mg/l and absorption of 0.3 lb COD per pound of GAC. Carbon disposal or regeneration included.
[e] Bioassay cost includes setup cost, two biomonitoring runs (96-hour and 48-hour tests for each run) for each period of treatment operation.
[f] The estimated total unit cost for runoff treatment over the 1983 period is $0.24 per gallon.

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Table 16
ESTIMATED COSTS FOR WASTEWATER MANAGEMENT
ALTERNATIVE 4

Month	Estimated Treated Volume[a] MG	Setup & Takedown Cost	Operating Cost[b]	Standby Cost[c]	Estimated Activated Carbon Cost[d]	Number of Loads[e]	Travel Distance[f] Miles	Hauling Cost	Analytical Cost[g]	Total Cost
April	1,646	$35,000	$42,000	$10,000	$274,000	314	6,280	$9,420	$47,250	$417,670
May		-								
June										
July										
August	1.06	35,000	30,000	10,000	190,000	202	4,040	15,480	30,750	$311,230
September										
October										
November										
December	0.720	35,000	21,000	10,000	150,000	140	2,800	4,200	22,500	$242,700
	3.422									$971,600

NOTES:

[a] See Table 8.
[b] Including equipment rental, maintenance, and operating labor. Daily estimated rate $5,250 with 150 gpm treatment flow rate.
[c] Standby cost includes equipment rental during nonoperating periods. Daily estimated rate $2,250 with 2 days of standby assumed for each operating period.
[d] Activated carbon consumption based on an average COD concentration of 6,000 mg/l and absorption of 0.3 lb COD per pound of GAC. Carbon disposal or regeneration included.
[e] Assuming 5,250 gallons per load using 5,500 gallon tankers
[f] Assuming one-way haul distance of 10 miles.
[g] Assuming organic scan with quantification of priority pollutant organics for one sample per 5 truck loads.

are essentially equal within the accuracy of the cost estimates (Order-of-Magnitude).

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VI. COMPARISON OF OFFSITE DISPOSAL ALTERNATIVES

A. DRUM WASTES

Advantages and disadvantages of each of the drum waste removal alternatives are summarized in Table 17 and discussed below.

Removal of all Drum Containing Flammable Liquids and Solids

The major advantage of this alternative is that it greatly reduces the fire hazard at the site. The alternative, however, requires that all drums be handled, even though only 45 percent will actually be removed. This increases the potential for drum damage spills or personal injury during removal since the remaining drums would have to be handled again during remedial action. This double handling as well as remobilization causes the ultimate costs of the alternative to greatly exceed the least expensive IRM alternative, removal of all waste drums. In addition to these disadvantages, the remaining drums would be subject to weathering and deterioration, adding to the potential for groundwater and surface water contamination.

Removal of all Drums Containing Flammable Liquids and Solids, Oils and Chlorinated Solvents

Advantages and disadvantages of this alternative are similar to the preceding alternative with the differences reflective of the removal of oils and chlorinated solvents. Though IRM costs increase, ultimate removal costs are less due to fewer drums being handled twice. The fire hazard from drum wastes is essentially eliminated in this alternative. Also toxicological hazards are reduced as more hazardous liquids are removed. The potential for groundwater and surface

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Table 17
SUMMARY OF ADVANTAGES AND DISADVANTAGES OF DRUM REMOVAL ALTERNATIVES

Waste Drum Removal Alternative Description	Advantages of Alternative	Disadvantages of Alternative
1. Remove Only Flammable Liquids and Solids	o Greatly reduces fire hazard o Eliminates toxicological hazards of the non-chlorinated solvents	o Potential remains for groundwater and surface water contamination by nonflammable liquid waste o Requires double handling and probable relocation of other drums not removed during the IRM work, increasing potential for drum damage, spills and personal injury o Remaining drums subject to weathering and deterioration o Remaining drums must be removed during RA effort
2. Remove All Flammable Liquids and Solids, Oils and Chlorinated Solvents	o Eliminates fire hazard o Eliminates toxicological hazards of chlorinated solvents o Reduced potential for groundwater contamination by waste liquids	o Potential remains for groundwater and surface water contamination by remaining waste liquids o Requires double handling and probable relocation of other drums not removed during the IRM work, increasing potential drum damage, spills and personal injury o Remaining drums subject to weathering and deterioration o Remaining drums must be removed in 2nd effort during RA
3. Remove All Drummed Liquid Wastes	o Eliminates fire hazard o Eliminates toxicological hazards chlorinated solvents o Eliminates the potential for groundwater contamination by waste liquids	o Limited potential remains for groundwater contamination by remaining waste solids through leaching precipitation o Requires double handling of relatively small number of other drums not removed during the IRM work, increasing potential for drum damage, spills and personal injury o Remaining drums subject to weathering and deterioration o Remaining drums must be removed in 2nd effort during RA
4. Removal All Waste Drums	o Eliminates all fire and toxicological hazards o Eliminates the potential for further groundwater contamination o Creates space for future RA work	o Most expensive alternative with respect to IRM costs

water contamination by deteriorating drums is also reduced though still substantial with approximately 9,000 drums still onsite until remedial action.

Removal of all Drummed Liquid Waste

In addition to the advantages of the previous alternatives, this level of action significantly reduces the potential for groundwater and surface water contamination by removing all drummed liquid wastes. In addition, working area in the drum storage lots would be made available under this alternative since about 77 percent of the drums would be removed and the remaining drums (mostly inert solids and empties) could probably be stacked two levels high.

Disadvantages of the alternative are reduced from the preceding alternative but still are substantial in terms of additional costs for ultimate removal of all drums and in the potential for drum damage, spills and personal injury due to the additional drum handling requirements.

Removal of all Waste Drums

This alternative eliminates all potential fire, explosion, toxic exposure, groundwater and surface water contamination hazards presented by the drummed wastes. Complete drum removal also permits grading of the drum storage areas for runoff control immediately following drum removal. Complete removal also eliminates a potential source of delay for RA activities that could result if drums remained onsite after IRM activities. Double handling of drums with its additional hazards and costs is also eliminated. Though this alternative is the most expensive IRM for drum removal it is the least expensive in terms of ultimate removal costs.

B. BULK WASTES

Advantages and disadvantages of each of the bulk tank waste removal alternatives are summarized in Table 18 and discussed below.

Removal of all Bulk Liquids as Hazardous Wastes with No Combustion Value

The offsite disposal of all bulk liquid wastes as hazardous wastes with no combustion value eliminates the fire and explosion hazard associated with storing large volumes of solvents onsite. However, the disposal costs associated with this bulk waste IRM are maximized due to the categorization as a hazardous waste with no combustion value. No benefit is received for the combustion value of the wastes. All solids removed from the bulk tanks will be drummed and stored onsite until removed as part of drum removal activities.

Removal of all Bulk Liquids, a portion as Hazardous Wastes and the remainder as Combustible Material

This bulk waste offsite disposal alternative eliminates the fire and explosion hazard associated with storing large volumes of solvents and other flammable materials onsite. The costs for this alternative are less than those of the previous alternative because it has been assumed that some of the bulk solvents have a combustion value that can be realized. That is, it has been assumed that selected wastes have sufficient value that a contractor will remove them from the site at no cost. All solids removed from the bulk

Table 18
SUMMARY OF ADVANTAGES AND DISADVANTAGES OF BULK WASTE
REMOVAL ALTERNATIVES

Bulk Waste Removal Alternative Description	Advantages	Disadvantages
Remove all bulk liquids as hazardous wastes with no combustion value.	o Eliminates fire hazard	o No utilization of combustible solvents o High cost
Removal of all bulk liquids, a portion as hazardous wastes and the remainder as combustive wastes.	o Eliminates fire hazard o Combustion value of some solvents utilized	o Viability of alternative depends on bulk waste sample analysis
Remove all bulk liquids as combustible material.	o Eliminates fire hazard o Combustion value of bulk contents maximized	o Viability of alternative deposits on bulk waste sample analysis

tanks will be drummed and stored onsite until removed as part of drum removal activities.

Removal all Bulk Liquids as Combustible Material

Under this alternative, all bulk liquids are removed offsite and disposed of as a combustible material, eliminating the fire and explosion hazard associated with storing large volumes of solvents and other flammable materials onsite. The costs for this alternative are the lowest of the three bulk liquids offsite disposal alternatives due to the assumed combustion value of the materials. All solids removed from the bulk tanks will be drummed and stored onsite and removed as part of drum removal activities.

C. WASTEWATER MANAGEMENT

Advantages and disadvantages of wastewater management alternatives are summarized in Table 19 and discussed below.

Treat Wastewater at Local POTW

Treating the runoff and contaminated ponds at a local POTW such as the Belmont Plant minimizes total costs by eliminating the need for rental and O&M costs for an onsite treatment system. This alternative would have minimal onsite equipment requirements, thus minimizing onsite area requirements and it would provide flexibility to respond when the cooling pond reaches a designated level. The only significant disadvantage is the heavy truck traffic between the site and the POTW.

During the course of the analysis, additional analytical data from samples taken of the wastewater onsite showed higher levels of several contaminants than were previously

Table 19
SUMMARY OF ADVANTAGES AND DISADVANTAGES OF THE
WASTEWATER MANAGEMENT ALTERNATIVES

Wastewater Management Alternative	Advantages of the Alternative	Disadvantages of the Alternative
1. Treat Wastewater at local POTW	o Minimal onsite equipment required. o No rental, operation, or maintenance costs for onsite equipment. o Flexibility to respond as needed to remove accumulated runoff.	o Periods of heavy truck traffic required at site and POTW.
2. Treat Wastewater at Contractor-Owned Treatment Facility	o Same as Alternative 1.	o Periods of heavy truck traffic required at the site. o Very expensive.
3. Treat Wastewater Onsite and Discharge to a Nearby Creek	o Minimial increase in heavy truck traffic at the site.	o Significant area requirements for equipment layout and general operations activities. o NPDES permitting process delays startup. o Final effluent discharge upstream of water reservoir.
4. Treat Wastewater Onsite and Discharge to POTW	o No need for NPDES permit. o Provides 2-stage treatment, onsite and at POTW. o Can be implemented quickly. o Final effluent discharge downstream of water reservoir.	o Significant area requirements for equipment layout and general operations activities. o Periods of heavy truck traffic required at the site.

reported. In consultation with the ISBH and EPA, this alternative was eliminated because it was no longer assured that the wastewater could be sufficiently treated at the POTW.

Treat Wastewater at Contractor Owned Facility

Treating wastewater at a contractor owned facility has the same advantages as the preceding alternative. Disadvantages, however, are greater due to the higher costs involved in transporting and treating the contaminated water.

Treat Wastewater Onsite and Discharge to a Nearby Creek

Onsite treatment and discharge to Finley Creek via the unnamed ditch is considerably less expensive than the preceding alternative. A significant disadvantage is that this alternative would require much more time before startup due to the NPDES permitting process. Also, the treatment system would require additional area for the equipment and operational activities on the already crowded site.

Treatment Onsite and Discharge to POTW

Onsite treatment and discharge to the collection system of the Belmont POTW is more expensive than the onsite treatment and discharge to the unnamed ditch due to the added hauling costs and the analytical costs. Onsite area requirements are similar between the alternatives. This alternative, however, greatly shortens the time before startup because an NPDES permit would not be required.

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VII. RECOMMENDATIONS

Based upon the information developed during this focused RI/FS, the following offsite disposal alternatives are recommended for implementation as IRM's:

- Remove all drum wastes and empty drums and dispose of them offsite.

- Following drum removal, remove all bulk liquids and portable bulk tanks and dispose of them offsite. The removal alternative is not specified at this time due to the lack of sufficient bulk tank content test data.

- Treat wastewater onsite and transport it to the Belmont POTW collection system.

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